DE-STA-CO

A DOVER COMPANY

Automation

Robohand FERGUSON

CAMCO

SERVICE MANUAL

HEAVY-DUTY E-SERIES INDEX DRIVES
MODELS
950E, 1150E, 1550E, 2050E

WARNING

This is a controlled document. It is your responsibility to deliver this information to the end user of the CAMCO or FERGUSON product. Failure to deliver this could result in your liability for injury to the user or damage to the machine. For copies of this manual, call your Customer Service Representative at 800-645-5207

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INTRODUCTION

This service manual pertains to the disassembly and assembly of CAMCO's Heavy Duty "E" Series Index Drive models 950E, 1150E, 1550E & 2050E.

This manual is to be used in conjunction with the General Service Manual, which describes the lubrication and general maintenance of CAMCO Index Drives.

A cross section view of a typical CAMCO Heavy Duty "E" Series Index Drive model 950E, 1150E, 1550E or 2050E is included in this manual. Item numbers within this Service Manual refer to the cross section view. Also included is a generic Bill of Materials for your convenience in identifying and ordering spare or replacement parts. Always provide the serial number from the Index Drive when ordering spare or replacement parts.

Some users of Index Drives have facilities and trained personnel to accomplish service repair. You must determine the extent to which intricate servicing should be done by your own maintenance personnel. When in doubt, CAMCO recommends the assistance of a CAMCO trained serviceman when making repairs.

CAMCO suggests that it is best to completely remove all tooling from CAMCO's Heavy Duty "E" Series Index Drive prior to completing repairs. Realistically, removing all tooling from CAMCO's Heavy Duty "E" Series Index Drive is prohibitive. Tooling should be removed only as necessary in order to complete one or more of the following four related procedures. The degree of disassembly increases with the addition of each procedure.

1. Input Oil Seal Replacement

Usually all tooling can be left in place when replacing oil seals. Removal of some portions of the drive package might be required. See the section titled "Oil Seal Replacement" in this Service Manual for complete details.

2. Cam Follower Replacement

If the machine builder has provided access to the cam follower screws, the tooling does not need to be removed. Cam followers can be replaced through the side access cover and follower access cover. See the section titled "Cam Follower Replacement" in this Service Manual for complete details.

3. Input Shaft and/or Cam Replacement

In most cases, the input shaft and cam can be removed without removing all tooling. A section of the support structure and fixtures can be removed, or the support structure and fixtures can be lifted two to three feet above the unit and supported by appropriate scaffolding. CAMCO recommends using professional machinery riggers for this purpose. The assistance of a CAMCO trained serviceman is recommended. See the section titled "Input Shaft and/or Cam Replacement " in this Service Manual for complete details.

Follower Wheel and/or Output Bearing Replacement

In most cases, the follower wheel and/or output bearing cannot be removed without removing the major portion of any support structure and fixtures. An overhead hoist, boom crane or similar device must be used to lift the follower wheel and output bearing. In some cases, the support structure and fixtures can be lifted two to three feet above the unit and supported by appropriate scaffolding. The follower wheel and output bearing can then be removed with a boom crane or similar device. CAMCO recommends using professional machinery riggers for this purpose. The assistance of a CAMCO trained serviceman is recommended. See the section "Follower Wheel and/or Output Bearing Replacement" is this Service Manual for complete details.

WARNINGS AND CAUTIONS:
Statements in this manual proceeded by the words *WARNING* or *CAUTION* and printed in *italics* are very important. CAMCO recommends you take special notice of these during service or repair.

WARNING
Means there is the possibility of personal injury to yourself or others.

CAUTION
Means there is the possibility of damage to the CAMCO unit.

SPARE PARTS KIT:

CAMCO offers a spare parts kit for all CAMCO index drive models manufactured by CAMCO. The spare parts kit for CAMCO's Heavy Duty "E" Series Index Drive includes input oil seals, input bearings, and input shims. Cam followers are not included in the spare parts kit. CAMCO recommends a spare parts kit and cam followers be purchased and kept on hand prior to any disassembly of your CAMCO E-Series Index Drive.

BEFORE STARTING:

CAMCO uses either Red Perma-Lok®, #HM118 or Green Perma-Lok®, #HM160 to secure most screws and set screws. Exceptions are removable covers, etc. If you encounter a fastener that is difficult to remove, apply heat to the screw and remove while still warm.

CAUTION
Localized heat can distort the part. Do not overheat any item.

WARNING
Disassembly and repair of a CAMCO Heavy Duty "E" Series Index Drive requires lifting and manipulating large cumbersome parts. Use the following table with approximate weights as a guide in selecting hoist, etc.

APPROXIMATE COMPONENT PART WEIGHT:

Index Drive	Input Shaft (lbs)	Cam (lbs)	Follower Wheel	Output Bearing
950E	205.0	400.0	720.0	250.0
1150E	335.0	800.0	1200.0	325.0
1550E	600.0	1350.0	2665.0	1200.0
2050E	915.0	3950.0	4950.0	1265.0

CAUTION
Disassembly and repair of a CAMCO Heavy Duty "E" Series Index Drive requires special tools not normally available. A partial list of commercially available tools is provided. Some special tools and equipment must be manufactured by maintenance personnel on site. Using the proper tool is mandatory for successfully completing repairs.

SPECIAL TOOLS:

Repair of any CAMCO Heavy Duty "E" Series Index Drive requires the following special tools,

1. Air Impact Wrench, 1" Drive, 2000 ft-lbs
2. Torque Wrench, 1" Drive, 2000 ft-lbs
3. Large Styrofoam container (Igloo, 50 or 60 gallon Ice Chest) three-quarters filled with dry ice.

The following special tools are unique to the individual "E" Series Index Drive.

Index Drive	Input Lock Nuts	Cam Follower Screws
950E	Spanner Wrench PN22	(H80 Flw.) 10MM Hex Socket, 1" Drive (H96 Flw.) 14MM Hex Socket, 1" Drive
1150E	Spanner Wrench PN28	(H128 Flw.) 17MM Hex Socket, 1" Drive
1550E	Spanner Wrench PN36	(H128 Flw.) 17MM Hex Socket, 1" Drive (H160 Flw.) 19MM Hex Socket, 1" Drive
2050E	Spanner Wrench PN36	(H192 Flw.) 22MM Hex Socket, 1" Drive

WARNING

CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

Before starting disassembly of your CAMCO unit you should read and review the following instructions. These provide important information on parts and procedures necessary to successfully complete your repair.

Comply with all ***WARNINGS*** and ***CAUTIONS!***

Read the "Trouble Shooting Guide" section in your "General Service Manual" before disassembling CAMCO units. CAMCO recommends the assistance of a CAMCO trained serviceman whenever repairs are more involved than replacing oil seals or cam followers.

TORQUE REQUIREMENTS FOR TIGHTENING SCREWS:

The included table provides torque specification for US Standard and Metric Socket Head Cap Screw. Refer to CAMCO's "General Service Manual" for a complete listing of torque specification by grade and material.

US Standard Socket Head Cap Screw		Metric Socket Head Cap Screw	
Thread Size	Torque (ft/lbs)	Thread Size	Torque (ft/lbs)
.250-20	12	M6	12
.312-18	24	M8	29
.375-16	45	M10	57
.500-13	110	M12	100
.562-12	150	M14	159
.625-11	210	M16	243
.750-10	380	M20	479
1.00-8	910	M24	811
1.125-7	1290	M30	1637

Torque values are for non-lubricated threads, coated only with a residual film of oil, as received from the manufacturer. Values are for threads engaged 1.5 times the screw thread diameter and installed into steel parts.

DISASSEMBLY AND INSPECTION:

DISASSEMBLY:

1. Remove only those structural members and fixtures required to gain access to the index drive and to allow for completing the necessary procedures.

2. Drain oil and flush with flushing solvent. Retain any chips or broken pieces you may find. These may aid in diagnosis.

   2.1. Oil may be drained by removing Magnetic Drain Plug (Item #23).

   2.2. Alternatively, oil may be drained by removing Cover (Item#7) and pumping the oil from the unit's sump.

3. Remove socket head cap screws (Item # 27) and Cover (Item #6).

INSPECTION:

1. While slowly rotating input, inspect cam (Item #4) surface to determine if cam must be replaced. Inspect for a rough or rippled surface, gouge marks, pitting and other imperfections.

WARNING
CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

2. Slowly index the unit and place the Index Drive in a dwell position.

   2.1. While manually applying torque to the output follower wheel (Item #2), check for pre-load in dwell. Try to rotate the cam followers (Item #14) that are in dwell.

   2.2. Visually observe the surface of the outer shell. Inspect followers for damage or radial looseness. Looseness should not exceed .001 inch. Do not confuse radial looseness with axial endplay. End play will be from .03 to .06 inch as a normal condition. If endplay exceeds .06 inch the followers should be replaced.

NOTE: Generally, cam followers are replaced as added insurance against later failure. When in doubt, replace the cam followers.

3. Broken cam followers indicate possible damage to the follower wheel. Remove any broken cam followers. See the section titled "Cam Follower Replacement", in this Service Manual. Inspect the cam follower stud hole in the follower wheel for damage, and to determine whether the cam follower stud hole is "wallowed out", elongated, oval, etc. Using the nominal size of the cam follower stud as a guide, verify a press fit between the stud and the hole, -. 0005 to -. 0010 inch for the full length of the hole.

4. Wobbling of the output or grinding noises during each index indicate damage to the output bearing (Item #5). Further inspection requires removal of the follower wheel. See the section titled "Follower Wheel and Output Bearing Replacement" in this Service Manual.

5. Replace cam followers if loose in dwell or if the outer shell is visibly damaged. See the section titled "Cam Follower Replacement" in this Service Manual.

6. Replace the cam if imperfections are noted. See the section titled "Cam and/or Input Shaft Replacement" in this Service Manual.

7. Replace the follower wheel if holes are oversized. See the section titled "Follower Wheel and Output Bearing Replacement" in this Service Manual.

OIL SEAL REPLACEMENT:

CAMCO recommends replacing the Input oil seals (Item #13) anytime the input is disassembled regardless of whether they are damaged or not. After being in service for some time, the sealing lip can become brittle and easily cracked. Most damage to oil seals occurs at assembly when recommended seal installation procedures are not followed.

To replace the oil seal on the reducer side of the index drive, remove the reducer and additional drive equipment as necessary to gain access to the seal. See the reducer and other manufacturers' Service Manuals for instructions on removing this equipment. On the other side of the index drive, remove visual dwell indicator or other equipment as necessary to gain access to the oil seal.

OIL SEAL REMOVAL:

1. To remove the oil seal, use a sharp punch and punch two (2) diametrically opposed holes through the case of the seal. Install sheet metal screws into the holes.

2. Use a Slide Hammer or Pliers (Vise Grips,) to grip the sheet metal screws to pull out the existing seal.

CAUTION
Do not drill holes in the case of the seal. Chips will get into the unit and they cannot be easily removed. A punched hole provides a better "bite" when installing sheet metal screws into the metal case.

OIL SEAL INSTALLATION:

1. Check new seal for damage that may have occurred prior to installation.

   1.1. An oil seal with a sealing lip that is turned back, cut or otherwise damaged should be replaced and not used.

   1.2. Likewise, if the outer face or outside diameter is bent or otherwise damaged, replace the oil seal.

2. Check the input shaft for surface nicks, burrs or a groove from the sealing lip. Look for spiral machine marks that can damage the seal lip.

   2.1. An input shaft with a groove from the sealing lip can be repaired with a Chicago Rawhide Speedi-Sleeve, or similar product from another manufacturer. Consult the manufacturer for installation instructions.

   2.2. Alternatively, the input shaft could be replaced instead of repaired.

3. Check the end of the input shaft and remove any burrs or sharp edges. The end of the shaft should be chamfered.

4. Check splines and keyways for burrs or sharp edges.

5. Wrap the input shaft with plastic shim stock as a temporary sleeve to guide and protect the sealing lip.

6. Check the sealing lip direction. Make sure the new seal faces the same direction as the original. CAMCO's standard practice is to mount the seal so the lip faces the lubricant or fluid to be sealed.

7. Pre-lubricate the sealing element by wiping the surface with the lubricant being retained. Apply a thin layer of "General Electric Silicone Rubber RTV-6" or equivalent to the cartridge bore as a sealant. When the seal in pressed into place, a bead of sealant will form at the back edge of the steel case and prevent any leakage around the outside edge of the seal.

8. Whenever possible use an installation tool that has been specifically manufactured for installing the seal.

8.1. Installation tools should have an outside diameter .010 inch smaller than the bore size. The bore should be .005 larger than the shaft size, and the face of the tool should be relieved so that pressure is applied only near the outside diameter of the seal.

8.2. During installation press the seal flush to the cartridge face to avoid cocking the seal in the bore. This also positions the seal correctly on the shaft.

9. When an installation tool cannot be manufactured, install the seal by tapping uniformly around the seal with a soft hammer. Avoid cocking the seal and make sure the face of the seal is square to the bore.

CAM FOLLOWER REPLACEMENT:

CAM FOLLOWER REMOVAL:

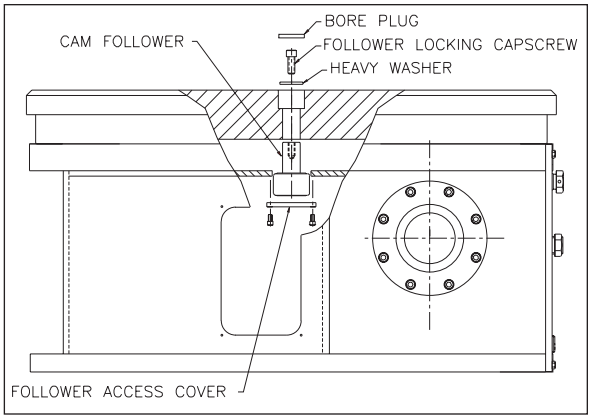
Instructions for replacing cam followers assume the cam and follower wheel will not be removed. If the follower wheel will be removed, proceed to the section titled "Follower Wheel and/or Output Bearing Replacement" in this Service Manual. Likewise, if the cam will be removed, proceed to the section titled "Cam and/or Input Shaft Replacement" in this Service Manual. Otherwise, proceed with the following steps.

If the machine builder has provided access to the cam follower screws, the tooling does not have to be removed. Otherwise the support structure and fixtures can be removed as necessary, or the support structure and fixtures can be lifted two to three feet above the unit and supported by appropriate scaffolding. CAMCO recommends using professional machinery riggers for this purpose. The assistance of a CAMCO trained serviceman is recommended.

At least three (3) hours before installing new cam followers, pack all new cam followers in a large Styrofoam container (Igloo, 50 or 60 gallon Ice Chest) three-quarters filled with dry ice.

1. Remove socket head cap screws (Item # 32) and remove side access cover (Item #10)

2. Once this cover is removed you may view inside to locate the follower access cover (Item #9). Remove the socket head cap screws (Item #25) and remove this cover.



CAM FOLLOWER REPLACEMENT
E-SERIES INDEX DRIVES

3. Use the motor and drive package to rotate the input shaft and follower wheel until a follower is positioned directly above and centered on the removal opening.

WARNING
CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

4. Remove bore plug (Item #33), the cam follower screw (Item #15) and the heavy washer (Item #9). CAMCO used Red Perma-Lok, to secure these screws If you encounter difficulty when removing the screw, apply heat to the screw and remove while still warm.

CAUTION
Localized heat can distort the part. Do not overheat any item.

5. Using a large soft faced hammer, drive the cam follower downward and out through the follower wheel.

6. Inspect each cam follower stud hole for roundness and size. The cam follower stud hole must be a interference fit. The cam follower holes must be -.0005 to -.0010 inch for the full length of the hole. Check the follower holes for roundness. These holes should be round within .0005 TIR of an inch to permit reuse of the follower wheel. These holes may be worn-out due to overloads.

CAUTION
Do not use a follower wheel with oversize follower holes. The cam followers and cam will fail prematurely.

CAM FOLLOWER INSTALLATION:

The instructions for replacing cam followers assume the follower wheel and cam were not removed. Cam followers will be installed one at a time through the follower access hole in the housing. If the follower wheel was removed, proceed by repeating the first four steps until all cam followers have been installed in the follower wheel.

If the cam was removed but not the follower wheel, proceed by repeating the first four steps until all but two cam followers have been replaced. Also see additional instructions below.

WARNING
Use protective gloves while handling cam followers after they have been packed in dry ice.

1. Coat the follower wheel stud hole with anti-seize lubricant. Using quick sure movements, place a cam follower that has been packed in dry ice for at least three (3) hours into the follower wheel hole.

   1.1. Using a twisting motion of the hand, push the cam follower upward hard enough to press the cam follower into the follower wheel hole. Make sure the shoulder on the cam follower seats against the follower wheel. Do not rush the process; just proceed quickly and with sure movements.

   1.2. If the cam follower cannot be seated by using a twisting motion of the hand and pushing upward, use a soft faced hammer to drive the cam follower into the follower wheel.

   1.3. Alternatively, pull the cam follower into place using the cam follower screw, heavy washer and tapped hole in the cam follower stud.

   1.4. In a worst case, place a steel plate against the bottom of the cam follower and use a hydraulic jack to push the cam follower into the follower wheel.

CAUTION
Make sure the shoulder of the cam follower is seated against the follower wheel and make sure the follower is installed straight and in line with the hole. Damage to the cam follower, follower wheel or cam could occur if cam follower is improperly aligned during installation.

2. Install heavy-duty washer and socket head cap screw, assembled as shown in sketch titled "Cam Follower Replacement E-Series Index Drives" in this Service Manual. Use Red Perma-Lok®, and torque the socket head cap screw to specification. The tightening torque depends on the size of the cam follower. See the table titled "Torque Requirements for Tightening Screws" in this Service Manual for tightening torque.

3. Install bore plug.

4. Repeat steps to install all cam followers.

5. If a new cam is being installed, install all but two (2) cam followers. See the section titled "Cam and/or input Shaft Replacement" in this Service Manual.

6. Re-install the socket head cap screws and follower access cover, using "General Electric Silicone Rubber RTV-6" or equivalent as a sealant.

7. Re-install the socket head cap screws and side access cover. This is an external cover and sealant is not required.

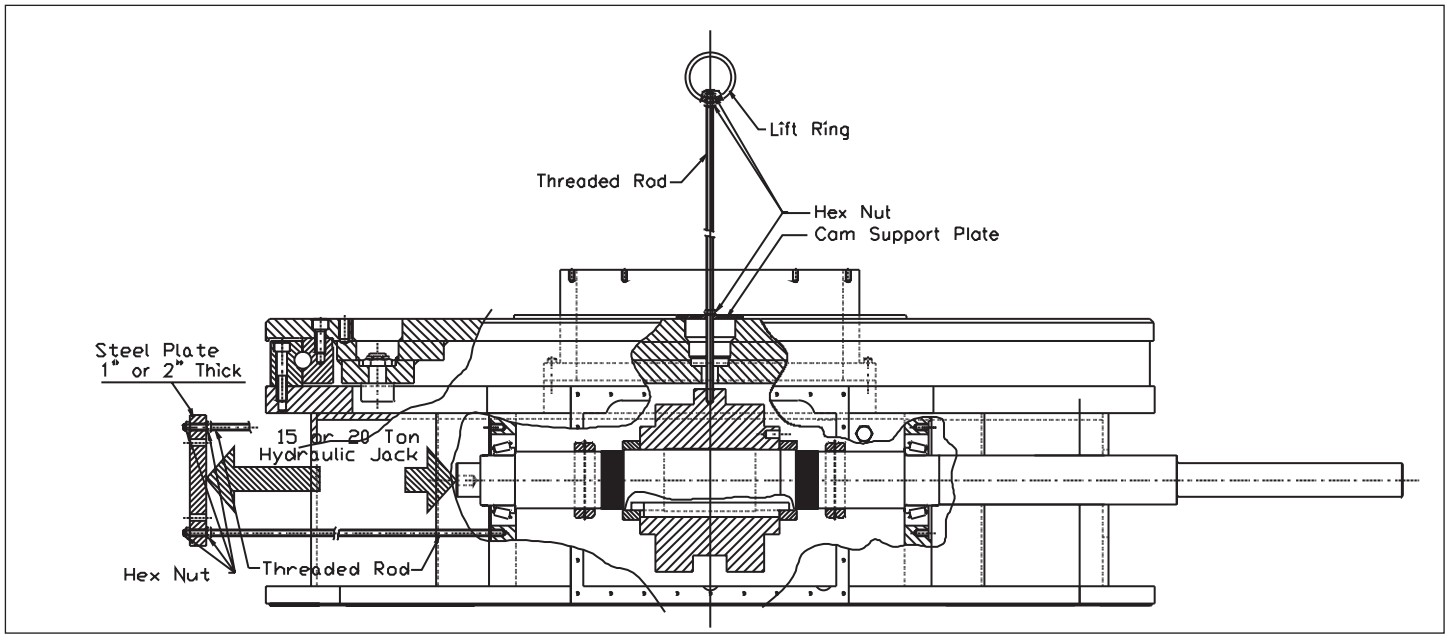
CAM AND/OR INPUT SHAFT REPLACEMENT:

INPUT SHAFT REMOVAL:

Instructions for removing the cam and input shaft assume the follower wheel will not be removed. If the follower wheel will be removed, proceed to the section titled "Follower Wheel and/or Output Bearing Replacement" in this Service Manual. Otherwise, proceed with the following steps.

If the machine builder has provided access holes to the cam follower screws, complete removal of the support structure and fixtures is not mandatory. The cam can be supported during removal with a threaded rod through one of the cam follower stud holes.

Otherwise, the support structure and fixtures must be removed, or the support structure and fixtures can be lifted two to three feet above the unit and supported by appropriate scaffolding. CAMCO recommends using professional machinery riggers for this purpose. The assistance of a CAMCO trained serviceman is recommended.



E-SERIES INPUT SHAFT AND CAM REMOVAL

1. Remove two or three cam followers. See section titled "Cam Follower Removal" in this Service Manual for detailed instructions on cam follower removal.

2. While referring to the sketch titled "E-Series Input Shaft And Cam Removal", proceed as follows.

3. Bend lockwasher (Item #20) tabs over and away from locknut.

4. Loosen the locknuts (Item #19) that secure the cam to the input shaft (Item #3). CAMCO uses Green Perma-Lok, to secure the locknuts. If you encounter difficulty, apply heat to the locknut and remove while still warm.

CAUTION

Localized heat can distort the part. Do not overheat any item..

4.1. Use a Spanner Wrench that has been locked (jammed) against the top or bottom of the housing to hold the locknut while turning the input shaft. Use the motor drive package to rotate the input shaft and break loose the locknuts.

WARNING

CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

4.2. Break loose the locknuts, don't completely loosen or remove them from the threaded portion of the input shaft.

4.3. In some cases it might be necessary to split the locknut before it will break loose. Use a cold chisel or other suitable tool for this purpose.

5. Depending on whether the follower wheel was removed, proceed as follows.

5.1. Follower wheel was <u>not removed</u>.

5.1.1. Use the motor drive package to rotate the input shaft and rotate the follower wheel through motion until a position is reached where one of the previously removed cam followers starts to enter the cam.

WARNING

CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

5.1.2. Rotate the follower wheel until the position of one removed cam follower is directly above the tapped "lifting hole" in the cam. See sketch titled "E-Series Input Shaft and Cam Removal" in this Service Manual.

5.1.3. Install threaded rod into the "lifting hole" in the cam and let the threaded rod extend beyond the top surface of the follower wheel. Put a hex nut on the threaded rod and run it down until the nut is tight against the cam. The length of the extension should be sufficient to lower the cam into the bottom of the housing.

5.1.4. Place a piece of plate (approximately 1/2" x 6" x 6") with a hole through the center over the threaded rod. This plate will act like a large washer for supporting the cam during removal of the input shaft. See sketch titled "E-Series Input Shaft and Cam Removal" in this Service Manual.

5.1.5. Put a hex nut on the threaded rod and run it down until the nut is snug against the plate and until the threaded rod is supporting the weight of the cam.

Note: The hole in the follower wheel and the tapped hole in the cam do not line up exactly. The threaded rod might be at a slight angle until the bearing cartridges are removed. This is acceptable, the threaded rod will straighten out when the bearing cartridges are removed. If threaded rod cannot be installed at this time, place wooden blocks under the cam for support and install threaded rod after removing the bearing cartridges.

5.2. Follower wheel was removed.

5.2.1. Install threaded rod into the "lifting hole" in the cam and let the threaded rod extend beyond the top surface of the housing. Put a hex nut on the threaded rod and run it down until the nut is tight against the cam. The length of the extension should be sufficient to lower the cam into the bottom of the housing.

5.2.2. Place a piece of plate (approximately 3/4" x 6" x 36") with a hole through the center over the threaded rod. This plate sitting on the top edge of the housing (or output bearing) will act as a support during removal of the input shaft. See sketch titled "E-Series Input Shaft and Cam Removal" in this Service Manual.

5.2.3. Put a hex nut on the threaded rod and run it down until the nut is snug against the plate and the threaded rod is supporting the weight of the cam.

6. Remove the reducer and any portion of the drive package that would interfere with removal of the input shaft.

7. Match mark the bearing cartridges. Eccentric cartridges are used in E-Series Index Drives to accommodate different cam diameters. The cartridges must be replaced in the same orientation as when removed. Remove all socket head cap screws (Item #24) securing the two (2) bearing cartridges (Item #11) to the housing (Item #1) and remove the bearing cartridges.

7.1. This can be done by striking the cartridge with a soft faced hammer to break any sealant and then prying the cartridge away from the housing.

7.2. The input oil seal (Item #13) and input bearing cup (Item #17) will stay with each bearing cartridge when it is removed. See sketch titled "E-Series Input Shaft and Cam Removal" in this Service Manual.

7.3. Make sure to note the color and number of any input shims (Item #12) at each cartridge. The color and number of shims used determines bearing preload.

8. Remove the input bearing cone (Item #17) on the side of the input shaft with the shortest extension.

8.1. The input bearing can be knocked off with an aluminum bar from the inside of the housing.

8.2. Alternatively a bearing puller can be used to remove the bearing.

9. Completely remove the locknuts and lockwashers on the side of the input shaft with the shortest extension. Loosen the locknuts and lockwashers on the other side of the input shaft until they are completely off the threaded portion of the input shaft.

10. Mount a puller to the housing on the side of the input shaft with the shortest extension. Use the tapped holes in the housing that were exposed when the bearing

cartridges were removed. See sketch titled "E-Series Input Shaft and Cam Removal" in this Service Manual.

10.1. Using diametrically opposed tapped holes, install two (2) threaded rods into the tapped holes. These rods should extend beyond the end of the input shaft sufficiently to allow for a hydraulic jack.

10.2. Between the threaded rods mount a 2" square bar with clearance holes to allow the threaded rod to pass through the bar.

10.3. Use hex nuts and washers on both sides of the 2" square bar to secure the bar to the threaded rod.

10.4. Place a hydraulic jack between the 2" square bar and the end of the input shaft. A 15 ton or 20 ton hydraulic jack is suggested.

11. Mount wood blocks between the cam and the housing to provide support (hold cam in position) when pushing the input shaft through and out of the cam.

11.1. On the side opposite the puller, the side of the input shaft with the long shaft extension, measure the distance between the cam and the housing. Cut wood blocks that sit on the bottom of the housing and rest against the cam and side of the housing to prevent the cam from moving laterally, i.e. so a hydraulic jack can be used to push out the input shaft.

12. Using a hydraulic jack, push the input shaft through the cam and out of the unit.

CAUTION
Support the input shaft as it is pushed out of the cam. Use a boom crane or other means for supporting the input shaft. See "Approximate Weights" within this service manual for sizing the lifting device. Make sure the input shaft doesn't fall when the end is pushed out of the cam and becomes unsupported.

13. Before proceeding, inspect the keyway in the input shaft to make sure they are to size. Also, inspect the oil seal diameters for burrs, scratches, nicks or dings

13.1. An oversize keyway must be remanufactured to proper specification.

13.2. Alternatively, the input shaft must be replaced.

CAUTION
Loose fitting keys can cause premature failure of the index drive.

14. Any imperfections must be removed from the oil seal surface on the input shaft. Otherwise, the oil seal will leak.

14.1. If an imperfections can not be "polished" out, resurface the oil seal diameter.

14.2. An alternative to resurfacing the oil seal diameter is a wear sleeve. See the section titled " Oil Seal Replacement" in this Service Manual.

15. Prepare the input shaft for assembly by removing the remaining locknuts and lock-washer and bearing cone from the input shaft.

16. Remove the bearing cups from the bearing cartridges, and remove the used oil seals from the bearing cartridges.

16.1. Measure the overall (stack) height of the bearing cones and bearing cups.

16.2. Record these values with the previously recorded values for input shim.

CAM REMOVAL:

1. Once the input shaft has been removed, use one of two methods to lower the cam into the bottom of the housing.

   1.1. Use a lift ring on the end of the treaded rod and a boom crane to lift the cam slightly, i. e. to relieve strain on the hex nut. Then while using the lift ring to support the cam, loosen the hex nut and back it off several inches. Use the boom crane to lower the cam into the bottom of the housing. See sketch titled "E-Series Input Shaft and Cam Removal" in this Service Manual.

   1.2. Or without using a lift ring (no access for a boom crane), slowly loosen the hex nut and lower the cam into the bottom of the housing.

CAUTION
See "Approximate Weights" within this service manual for sizing the lifting device. Make sure the cam is supported.

2. Once the cam is sitting on the bottom of the housing, remove the threaded rod, etc.

3. Use one of two methods to get the cam out of the housing cavity.

   3.1. Place a "Nylon Strap" through the bore of the cam, and while pulling on the strap, roll the cam out of the housing.

   3.2. Alternatively, insert a piece of threaded rod with a lift ring into the tapped hole in the cam and using the lift ring, pull the cam out of the housing cavity.

CAM INSTALLATION:

Instructions for replacing the cam assume the follower wheel was not removed.

Before proceeding with installation of the new cam, install all but two new cam followers. Manually pull the follower wheel into a position where one or more cam followers are over the housing cavity. Use a come-a-long or other device to pull the follower wheel and any attached tooling into position. Two or three cam followers can be accessed through the large access opening in the housing. See section titled "Cam Follower Replacement" in this Service Manual.

Do not install the last two (2) cam followers until the input shaft and cam have been installed.

Once all but two (2) cam followers have been replaced, place the cam inside the housing cavity.

1. Before placing the cam inside the housing cavity, check the input shaft diameter and the cam bore size to ensure a slip fit.

   1.1. The input shaft can be installed in the cam and then removed to ensure a slip fit.

   1.2. If the input shaft binds during installation, hone the cam bore to provide a slip fit.

CAUTION
The cam must be a slip fit or slight press fit, but the fit cannot be loose. Do not remove an excessive amount of material.

2. The cam can be either rolled into the housing cavity, or it can be lifted and pushed into the housing cavity. Use the best method as determined by the situation.

3. Regardless of the method used to place the cam in the housing cavity, placing the cam into the housing cavity will be an awkward process.

CAUTION
Make sure the cam is not damaged during this process.

4. Install threaded rod and lift ring into the lifting hole in the cam. Then lift the cam so the input shaft can be pushed through the cam.

4.1. Reverse one of the methods described for lowering the cam into the housing when lifting the cam. See section titled "Cam and/or Input Shaft Replacement" in this Service Manual.

INPUT SHAFT INSTALLATION:

1. Prepare the input shaft for installation by installing the locknuts and lockwasher on the side of the input shaft with the long shaft extension.

   1.1. Just start the locknuts onto the threaded portion of the input shaft. They will be snugged up later and tightened after setting the cam.

2. Measure the overall (stack) height of the new bearing cones and bearing cups.

   2.1. Compare the measured values to the same values as measured on used bearing cones and bearing cups.

   2.2. Use this measurement to adjust the amount of input shim used when installing the new bearings.

3. Install a new bearing cone onto the long extension of the input shaft.

   3.1. Coat the shaft with anti-seize lubricant prior to installation.

   3.2. Heat a new bearing cone in a commercial bearing oven that has been designed for this purpose. Heat evenly to about 250˚F.

   3.3. Alternatively. heat the bearing with a heat gun.

WARNING

Use protective gloves while handling bearings after they have been heated in an oven.

   3.4. Using a twisting motion of the hand, push the bearing cone against the shoulder on the input shaft.

CAUTION

Make sure the bearing is seated against the shaft shoulder. Improper mounting of the bearing can cause premature failure.

   3.5. If the bearing does not immediately seat against the shaft shoulder, use a piece of tubing over the shaft and against the bearing, and a soft hammer to drive the bearing against the shoulder.

4. Install the input shaft from the long extension side of the shaft.

5. The input shaft should be a slip fit to slight press fit into the cam. Use a rocking hand motion and push the input shaft through the cam.

   5.1. If the shaft becomes stuck, hit the end of the input shaft with a soft faced hammer and drive the input shaft through the cam.

   5.2. In a worst case, use a hydraulic jack to push the input shaft through the cam. See section titled "Cam and/or Input Shaft Replacement" in this Service Manual for construction of a puller and installation of wood blocks between the cam and the housing to provide support (hold cam in position) while pushing the input shaft through the cam.

6. Install locknuts and lockwasher on the opposite side of the cam. Inspect and reuse existing locknuts and lockwashers if they are not damaged.

   6.1. Just start the locknuts onto the threaded portion of the input shaft. They will be snugged up later and tightened after setting the cam.

7. Install a new Bearing Cone onto the short extension of the input shaft.

   7.1. Coat the shaft with anti-seize lubricant prior to installation.

7.2. Heat a new Bearing Cone in a commercial bearing oven that has been designed for this purpose. Heat evenly to about 250˚F.

7.3. Alternatively, heat the bearing with a heat gun.

WARNING
Use protective gloves while handling bearings after they have been heated in an oven.

7.4. Using a twisting motion of the hand, push the Bearing Cone against the shoulder on the input shaft.

CAUTION
Make sure the bearing is seated against the shaft shoulder. Improper mounting of the bearing can cause premature failure.

7.5. If the bearing does not immediately seat against the shaft shoulder, use a piece of tubing over the shaft and against the bearing, and a soft hammer to drive the bearing against the shoulder.

8. Use an Arbor Press to press the bearing cups to the input cartridges.

8.1. Coat the outside of the bearing cup with anti-seize lubricant prior to pressing into cartridge.

9. Re-install the bearing cartridges.

9.1. Use duplicate shims to those previously removed, but adjust the shims for the measured height of the bearings.

9.2. Apply a small bead of "General Electric Silicone Rubber RTV-6" at the intersection of the pilot diameter and flange before installing the bearing cartridges.

10. Install new oil seals. See section titled "Oil Seal Replacement" in this Service Manual for detailed instructions.

11. Check for input shaft endplay.

11.1. Endplay in the input shaft is not permissible. There should be preload on the input bearings. Use a dial indicator and a pry bar to check for endplay.

11.2. Heavier preload is preferred to endplay. Remove input shim if end play is detected.

11.3. With just the input shaft, cam and oil seals installed, preload can be measured with a torque wrench. An adapter between the input shaft and torque wrench is required, and the torque wrench must be capable of measured torque values up to 6000 in-lbs. See the table titled "Input Preload Torque" in this Service Manual.

INPUT PRELOAD TORQUE:

Camco E-Series Index Drive		
950E	1150E & 1550E	2050E
Input Preload Min.–Max.(in-lbs)		
500 - 2000	1000 – 4000	2000 - 6000

CAUTION
End play in the input shaft will cause premature failure of the Index Drive.

12. Re-install the reducer and any portion of the drive package that was previously removed.

CAUTION
Make sure the hollow shaft of the reducer and the input shaft is properly aligned. Misalignment of the reducer and input shaft will cause premature failure of the Index Drive.

SETTING CAM:

1. Install a dowel pin in the hole provided in the upper wall of the housing. The diameter varies depending on which E-Series Index Drive is being repaired. Polish the dowel pin as necessary to provide a slip fit into the hole.

2. With a depth micrometer, measure from the face of the dwell track on one side of the cam to the dowel pin.

3. Repeat this measurement from the opposite face of the dwell track to the dowel pin.

4. Use the locknuts to adjust the position of the cam relative to the dowel pin until the cam is centered.

   4.1. Use a Spanner Wrench to tighten the lugnut. Final tightening will occur after the cam has been set.

5. Manually rotate the follower wheel to engage the first cam follower into the cam.

6. With the motor and drive package rotate the input shaft until the cam followers are engaged in the cam. Continue rotating the input shaft and follower wheel until the follower stud hole is positioned directly above and centered on the follower access hole.

WARNING
CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

7. Install a new cam follower in this position. See section titled "Cam Follower Installation" in this Service Manual.

8. Repeat these steps until all remaining cam followers have been installed.

9. Apply Loctite, Prussian Blue #30520 or equivalent to both sides of the entire cam track.

10. Using the motor and drive package slowly rotate the input shaft and cam. If resistance is encountered, adjust the cam axially to a more suitable position.

WARNING
CAMCO Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

11. Repeat the process of applying Prussian Blue until the unit performs smoothly and the bluing pattern is quite uniform and there is no looseness in any dwell position. Index the unit through several indexes and check the entrance tips on all tracks.

CAUTION
There should be no looseness in any dwell position of the output.

   11.1. Make sure Prussian Blue is still visible on all tips.

   11.2. If not, readjust the position of the cam and repeat.

   11.3. If after several attempts to adjust the cam, Prussian Blue is not visible on all tips, hand grind the tips of the entrance track to provide relief.

CAUTION
The tips of the cam cannot be relieved prior to installation. This procedure must be completed while installing the cam.

CAUTION
Do not grind tips excessively.

CAUTION
Tip relief must be evident. If tips are not properly relieved, the cam followers will hit the tips when entering the cam. Eventually, this will crack the cam follower shell. Catastrophic damage will occur.

12. Once proper contact has been assured, use the following procedure to tighten the locknuts and secure the lockwasher tabs.

12.1. Back off both locknuts and the lockwasher on one side of the cam.

12.2. Apply Green Perma-Lok, to the threads on the input shaft.

12.3. Use a Spanner Wrench that has been locked (jammed) against the top or bottom of the housing to hold the locknut while turning the input shaft. Use the motor drive package to rotate the input shaft and tighten the locknut.

12.4. Repeat the previous step to tighten the second locknut on the same side of the cam.

WARNING
CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

13. Bend over the lockwasher tabs towards the locknut and into the slot.

CAUTION
A torque specification for locknuts is not available. Make sure they are tight!

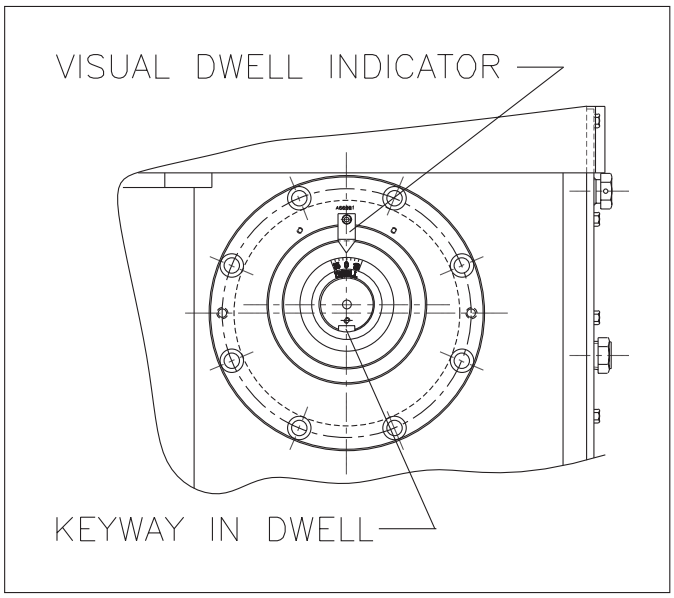
14. Repeat the above steps and tighten the locknuts on the opposite side of the cam.

15. After tightening locknuts, re-apply Prussian Blue and check for tip relief etc.

FOLLOWER WHEEL AND/OR OUTPUT BEARING REPLACEMENT:

FOLLOWER WHEEL REMOVAL:

In most cases, the follower wheel and/or output bearing cannot be removed without removing the major portion of any support structure and fixtures. An overhead crane or similar device must be used to lift the follower wheel and output bearing. In some cases, the support structure and fixtures can be lifted two to three feet above the unit and supported by appropriate scaffolding. The follower



DWELL POSITION, E-SERIES INDEX DRIVES

wheel and output bearing can then be removed with a boom crane or similar device. CAMCO recommends using professional machinery riggers for this purpose. The assistance of a CAMCO trained serviceman is recommended.

1. Use the motor drive package to position the input shaft keyway such that the cam is just entering dwell.

Note: For most Camco E-Series Index Drives this is ten to fifteen (10˚ - 15˚) degrees clockwise or counter-clockwise from the mid-dwell position.

Refer to the model number of your Index Drive for the amount of dwell provided. Also refer to "Interpretation of Index Drive Model Number" in the General Service Manual.

WARNING
CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

2. Remove 16 to 40 socket head cap screws (item # 28). CAMCO used Red Perma-Lok®, when tightening these screws and it may require heating the screw for ease of removal.

CAUTION
Do not overheat. Overheating can distort mating parts.

Note: Some E-Series Index Drives may have pull type dowel pins installed between the follower wheel and output bearing. This is not standard practice. If dowel pins were installed, use a Slide Hammer and remove these dowel pins.

3. Thread lifting eyes into the tapped holes in the output face of the follower wheel. (Two places 180 degrees apart or three places 120 degrees apart).

4. Using a boom crane or hoist, lift up the follower wheel. The follower wheel should break free at this point and permit it to be lifted clear. If binding occurs between the output wheel and the locating pilot, break free by tapping the follower wheel with a soft faced hammer, alternating from side to side.

CAUTION
See "Approximate Weights" within this Service Manual for sizing the lift device.

OUTPUT BEARING REMOVAL:

1. If the output bearing (Item #2) is to be replaced, remove the 16 to 40 socket head cap screws (Item #30) fastening the output bearing (Item #6) to the housing. CAMCO used Red Perma-Lok, when tightening these screws and it may require heating the screw for ease of removal.

CAUTION
Do not overheat. Overheating can distort mating parts.

2. From the underside of the housing flange, drive the dowel pins (Item # 31) upward and out of the bearing.

3. Thread lifting eyes into the tapped holes in the top face of the output bearing. (two places 180 degrees apart or three places 120 degrees apart).

4. Using a boom crane or hoist, lift up the output bearing. The output bearing should break free at this point and permit lifting it clear. If binding occurs, break the output bearing free by tapping the bearing with a soft faced hammer, alternating from side to side.

CAUTION
See "Approximate Weights" within this Service Manual for sizing the lift device.

OUTPUT BEARING INSTALLATION:

1. Install the output bearing using the following steps.

2. Apply a bead of "General Electric Silicone Rubber RTV-6" on top of the housing in the area of bearing contact.

3. Thread lifting eyes into the threaded holes in the bearing (two places 180 degrees apart or three places 120 degrees apart) and using a boom crane or hoist set the bearing onto the housing.

4. Coat the dowel pin holes with anti-seize lubricant and drive the dowel pins through the bearing and into the housing.

5. Apply Red Perma-Lok, and install 16 to 40 socket head cap screws. Tighten to specification. See "Metric Screw Tightening Torques" in this Service Manual.

FOLLOWER WHEEL INSTALLATION:

Prior to installing the follower wheel proceed as follows. Replace all cam followers in the follower wheel. See the section titled "Cam Follower Installation" in this Service Manual. Install cam and input shaft if they were removed. See the section titled "Cam and Input Shaft Installation" in this Service Manual. Clean and deburr all parts before re-assembly. Follow tightening torque and Perma-Lok®, recommendations as outlined in this Service Manual and the "General Service Manual".

1. Install follower wheel using the following steps.

   1.1. Use a boom crane or hoist to lower the follower wheel into the pilot on the output bearing.

   1.2. With the cam in place, be sure to position the followers on either side of the cam rib. The cam must be just entering dwell and at the start of motion.

Note: For most Camco E-Series Index Drives this is ten to fifteen (10˚ - 15˚) degrees clockwise or counter-clockwise from the mid-dwell position. Refer to the model number of your Index Drive for the amount of dwell provided. Also refer to "Interpretation of Index Drive Model Number" in the General Service Manual.

   1.3. If used, install pull type dowel pins. Apply Red Perma-Lok.

   1.4. Install 16 to 40 socket head cap screws. Tighten to specification. See table titled “Torque Requirements For Tightening Screws” in this Service Manual.

FINAL ASSEMBLY:

1. Reinstall the Large Access Cover.

   1.1. Apply a thin bead of "General Electric Silicone Rubber RTV-6" or equivalent to the housing area where the cover seats.

2. Fill the index drive with recommended oil to level indicated by the Sight Glass. Lubricating oils should be high quality, well refined petroleum oils or synthetic lubricants with extreme pressure additives. They may be subjected to high operating temperatures, so they must have good resistance to oxidation. These oils should meet the American Gear Manufactures Association (AGMA) standards, AGMA 4 EP or AGMA 5 EP. Two such oils are:

   Mobil's, Mobilgear 630, AGMA 5 EP

   Mobil's, Mobil Synthetic oil SHC634, AGMA 8 EP

   See "General Service Manual" for compete lubrication specifications.

   A slightly high oil level will cause no damage. Too low a level may result in unit failure.

3. Lubricate the output bearing with grease. Use grease that conforms to NGLI #2 or NGLI #3. One such grease Is:

   Mobil's Mobillith AW2

   See "General Service Manual" for compete lubrication specifications.

4. Adequate grease can be maintained in a reused bearing by lubricating with four- (4) oz. of grease. The bearing must be rotating while lube (grease) is injected into

the bearing to ensure that new grease is being distributed throughout the bearing and not just purging past the seals. Inject the recommended amount divided by the number of stops during each index for one full revolution of the table.

WARNING
CAMCO's Heavy Duty "E" Series Index Drives cannot be "hand cranked" when completely assembled, i.e. with follower wheel installed. During some portions of repair, the motor drive package is used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs.

HOW TO ORDER PARTS:

Please refer to the parts lists shown in this Service Manual. These parts lists are for standard Index Drives. If you feel your drive is nonstandard or you are in doubt, you should contact CAMCO Customer Service at (847) 459-5200 and request a Bill of Materials for your specific unit based on its serial number. Alternatively, contact your local CAMCO Sales Representative. A complete list of CAMCO Sales Offices is available on CAMCO's web site, (http://www.camcoindex.com). CAMCO maintains hard copy records on all units for a period of seven (7) years.

You may order parts per the standard Bill of Material even if your unit is nonstandard. CAMCO's Customer Service Representative will review the closed order file based on the following information and supply you with the correct part.

REQUIRED INFORMATION:

1. Original purchase order number (if available)
2. Customer name (original purchaser of drive)
3. Model number (located on name plate)
4. Serial number (located on name plate) (essential when ordering parts)
5. Approximate date of purchase

TO ORDER PARTS:

Contact CAMCO's "Order Entry Department" Wheeling, Illinois, Phone (847) 459-5200 or FAX (847) 459-3064,
E-mail: mktg@camcoindex.com,
or Internet: http://www.camcoindex.com
Describe the parts required and the 14 digit part number as listed in the Standard Bill of Materials or a Special Bill of Materials pertaining to your unit. State if you are using a Standard or Special Bill of Materials.

Give as much of the above required information as possible.

ON WARRANTY:

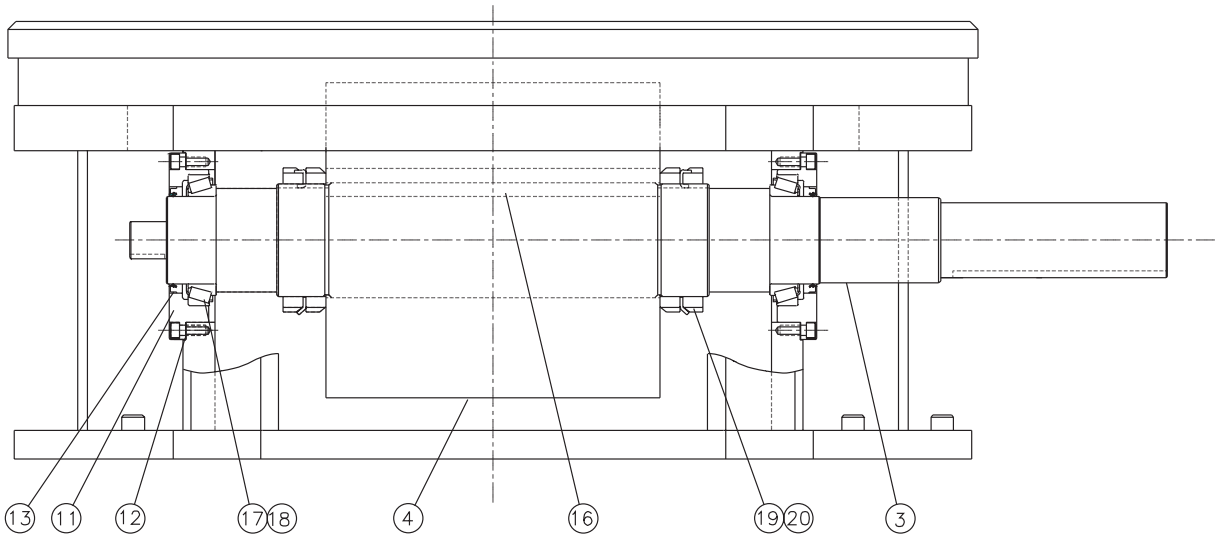
CAMCO will send replacement parts freight prepaid via the most practical means.

CAMCO will issue a "Returned Material Authorization Number" (RMA#) for the return of defective parts for inspection. CAMCO will invoice customer for repair parts. When inspection of returned parts has been completed and determined to be a warranty problem, CAMCO will then issue a credit to the customer for repair parts and freight charges.

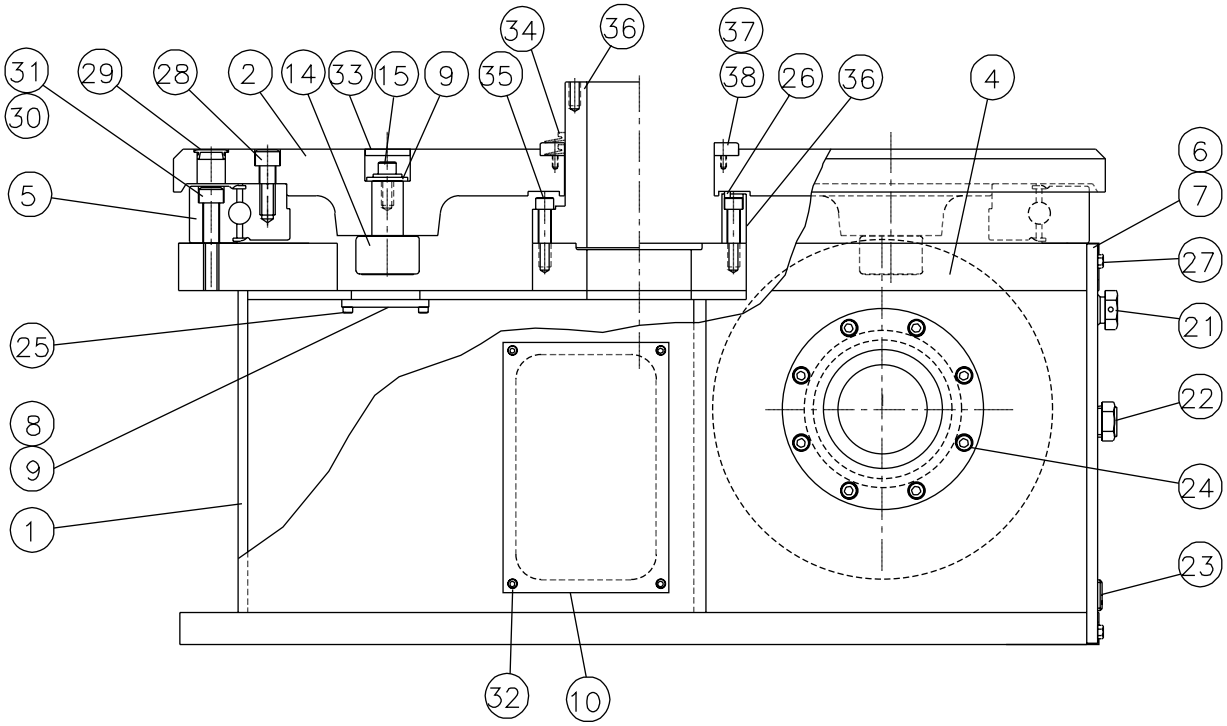
ON NON-WARRANTY:

Replacement or spare parts, with approved credit, are F.O.B. our plant Wheeling, Illinois.

950E, 1150E, 1550E, & 2050E



END VIEW



SIDE VIEW

PARTS LIST 950E INDEX DRIVE (STANDARD CONFIGURATION)

Item no	Part no.	Description
1	G2G70588001002	Hsg-Mach 950E
2	G2D70133034010	Flwr Whl Mach 950E 10H80
2	G2D70133064016	Flwr Whl Mach 950E 16H80
2	G2D70138014008	Flwr Whl Mach 950E 8H96
2	G2D70138024009	Flwr Whl Mach 950E 9H96
2	G2D70138034010	Flwr Whl Mach 950E 10H96
2	G2D70138044012	Flwr Whl Mach 950E 12H96
2	G2D70138064016	Flwr Whl Mach 950E 16H96
3	G2D70148007002	Shaft Inp DE 950E,4315/4407 Red
3	G2D70151007002	Shaft Inp DE 950E,4307 Red
3	G2D70191007002	Shaft Inp DE 950E,4215 Red
5	86C70072000000	Bearing Alt 950E
6	G2D70817002002	Cover Machined Main 950E
7	57B40937000000	Cover 1305RDM
8	E3B53523000000	Cover Cam Follower Removal 950E
9	95A26021260000	Washer Flat .50 VLIER 6002
9	95A26021280000	Washer Flat .75 VLIER 6004
10	G2C70181002002	Cover Front 950E
11	G2D70128003002	Cartridge Mach 950E
12	G2B70237018800	Shim Inp 950E .002 Thk
12	G2B70237028800	Shim Inp 950E .005 Thk
12	G2B70237038800	Shim Inp 950E .010 Thk
13	84C65421480000	Metric oil Seal C/R 35430
14	82A70224000000	Cam Flwr RA-E H80 CFH56-2
14	82A70041000000	Cam Flwr RA-E H96 CFH386-1
15	95A33040650000	S.H.C.S. M12 X 25 (H80 Cam Flwr)
15	95A33040800000	S.H.C.S. M16 X 35 (H96 Cam Flwr)
16	100K0975	Key 1.000 Sq. X 9.75 Lg.
17	86C65182470000	Bearing 32018X
18	Not Used	
19	95A26009220000	Locknut PN-22
20	95A41521220000	Lockwasher WH-22
21	95A33000040000	Air Vent 1-11.5 N.P.T.
22	95A33001040000	Sight Plug #LSP-151-06-01
23	95A33003040000	Magnetic Plug Lisle #5062071
24	95A33040490000	S.H.C.S. M10 X 20 MM
25	95A33040180000	S.H.C.S. M6 X 16 MM
26	95A51513500000	Bearing Seal Ring Cord .25"SQ.
27	95A33040320000	S.H.C.S. M8 X 16 LG
27	95A33040340000	S.H.C.S. M8 X 25 MM
28	95A33040820000	S.H.C.S M16 X 45 MM
29	99A66293000000	Plug Snap In 414
30	95A33040860000	S.H.C.S. M16 X 65 MM
31	95A38175730000	Dowel Pin 16MM X 50MM
32	95A33040170000	S.H.C.S. M6 X 12 MM
33	4MA51903000000	Bore Plug 40RGD 1.81
33	84A70104000000	Bore Plug CPZ-2.000-.250
34	84A66655020000	V-Ring 401500
35	95A33040700000	S.H.C.S. M12 X 50 MM
36	G2C70162000000	Ring-Thru Hole, 950E
36	G2D70176010000	Stationary Center Post,950E
37	G2C70161000000	Pilot Ring 950E
38	95A33040180000	S.H.C.S. M6 X 16 MM
	99A44547010000	General Service Manual
	99A44547170000	Manual - 950E, 1150E, 1550E & 2050E

* Please Consult CAMCO For spare parts kit Information 800-645-5207

PARTS LIST 1150E INDEX DRIVE (STANDARD CONFIGURATION)

Item no	Part no.	Description
1	G3G70729001002	Hsg-Mach 1150E
2	E3D66990014008	Flwr Whl Mach 1150E 8H128
2	E3D66990024009	Flwr Whl Mach 1150E 9H128
2	E3D66990034010	Flwr Whl Mach 1150E 10H128
2	E3D66990044012	Flwr Whl Mach 1150E 12H128
2	E3D66990064016	Flwr Whl Mach 1150E 16H128
3	G3D70967007002	Shaft Inp DE 1150E,407-415 Red
3	G3D70968007002	Shaft Inp DE 1150E,507/4507 Red
3	G3D70970007002	Shaft Inp DE 1150E,307-315-85M Red
5	E3C67026000000	Bearing Alt 1150E
6	G3D70730002002	Cover-Mach 1150E
7	57B40937000000	Cover 1305RDM
8	E3B66073002002	Cover Cam Follower Removal 1150E
9	95A66081000000	Washer Hd .81 X 2.44 X .25
10	E3B53528000000	Cover, Side 1150E
11	E3D67020003002	Cartridge Mach 1150E
12	E3B67075018800	Shim Inp 1150E .002 Thk
12	E3B67075028800	Shim Inp 1150E .005 Thk
12	E3B67075038800	Shim Inp 1150E .010 Thk
13	84C65421600000	oil Seal C/R 47230
14	82A66968000000	Cam Flwr RA-E H128 CFH586-2
15	95A33040940000	S.H.C.S. M20 X 40 MM
16	125K1350	Key 1.25 Sq X 13.50 Lg
17	86C65182600000	Brg Assy 32024X (9ENA2)
18	Not Used	
19	95A26009280000	Locknut PN-28
20	95A41521280000	Lockwasher WH-28
21	95A33000040000	Air Vent 1-11.5 N.P.T
22	95A33001040000	Sight Plug #LSP-151-06-01
23	95A33003040000	Magnetic Plug Lisle #5062071
24	95A33040660000	S.H.C.S. M12 X 30 MM
25	95A33040320000	S.H.C.S. M8 X 16 MM
26	95A51513500000	Bearing Seal Ring Cord .25"SQ.
27	95A37940310000	H.H.C.S. M8 X12 MM
27	95A37940330000	H.H.C.S. M8 X 20 MM
28	95A33040970000	S.H.C.S. M20 X 55 MM
29	99A66293000000	Plug Snap IN 414
30	95A33040990000	S.H.C.S. M20 X 65 (#39751)
31	95A38175820000	Dowel Pin 20MM X 60MM
32	95A33040160000	S.H.C.S. M6 X 10 MM
33	99A67365000000	Bore Plug CPZ-2.501-.312
34	84A66655000000	V-Ring C/R 403250
35	95A33040710000	S.H.C.S. M12 X 55MM
36	E3C66985000000	Ring-Thru Hole, 1150E
36	E3D66984010000	Stationary Center Post, 1150E
37	E3C66986000000	Pilot Ring 1150E
38	95A33040320000	S.H.C.S. M8 X 16 MM
	99A44547010000	General Service Manual
	99A44547170000	Manual - 950E, 1150E, 1550E & 2050E

* Please Consult CAMCO For spare parts kit Information 800-645-5207

PARTS LIST 1550E INDEX DRIVE (STANDARD CONFIGURATION)

Item no	Part no.	Description
1	G4G70768001002	Hsg-Mach 1550E
2	G4G70349014010	Flwr Whl Mach 1550E 10H128
2	G4G70349024010	Flwr Whl Mach 1550E 10H160
2	G4G70349034012	Flwr Whl Mach 1550E 12H128
2	G4G70349044012	Flwr Whl Mach 1550E 12H160
2	G4G70349074016	Flwr Whl Mach 1550E 16H160
3	G4D70433007002	Shaft Inp DE 1550E,307-315 Red
3	G4D70444007002	Shaft Inp DE 1550E,407-415 Red
3	G4D70446007002	Shaft Inp DE 1550E,4507 Red
5	86C70271000000	Bearing Alt, Output 1550E
6	G4D70774002002	Cover-Mach, 1550E
7	57B40937000000	Cover 1305RDM
8	G4B70388002002	Cover Cam Follower Removal,1550E
9	95A66081000000	Washer Hd .81 X 2.44 X .25
9	95A66081030000	Washer Heavy, "E" Series Cam Flwr
10	15B48695000000	Cover, Side Access 1550E
11	G4D70392003002	Cart Mach InP,1550E
12	G4B70439018800	Shim Inp 1550E .002 Thk
12	G4B70439028800	Shim Inp 1550E .005 Thk
12	G4B70439038800	Shim Inp 1550E .010 Thk
13	84C65421650000	Metric oil Seal C/R#55118
14	82A66968000000	Cam Flwr RA-E H128 CFH586-2
14	82A65896000000	Cam Flwr RA-E H160 CFH587-2
15	95A33040940000	S.H.C.S. M20 X 40 MM
15	95A63499020000	S.H.C.S. 24MM X 50MM LG
16	175K1750	KEY 1.750 SQ.X17.50 LG
17	86C65182670000	Bearing Assy 32028X
18	Not Used	
19	95A55752000000	Locknut PN-36
20	95A55753000000	Lockwasher WH-36
21	95A33000040000	Air Vent 1-11.5 N.P.T.
22	95A33001040000	Sight Plug #LSP-151-06-01
23	95A33003040000	Magnetic Plug Lisle #5062071
24	95A33040810000	S.H.C.S. M16 X 40 MM
25	95A33040320000	S.H.C.S. M8 X 16 MM
26	95A51513500000	Bearing Seal Ring Cord .25"SQ.
27	95A37940310000	H.H.C.S. M8 X12 MM
27	95A37940330000	H.H.C.S. M8 X 20 MM
28	95A33040980000	S.H.C.S. M20 X 60 MM
29	99A66293000000	Plug Snap In 414
30	95A38805680000	S.H.C.S. M20 X 100 MM
31	95A38175820000	Dowel Pin 20 MM X 60 MM
32	95A33040160000	S.H.C.S. M6 X 10 MM
33	84A65330000000	Bore Plug 3.155(CP-80-12)
33	99A67365000000	Bore Plug CPZ-2.501-.312
34	84A66655030000	V-Ring C/R 405000
35	95A33040740000	S.H.C.S. M12 X 70 MM
36	G4C70353000000	Ring - Thru Hole, 1550E
36	G4C70358010000	Stationary Center Post, 1550E
37	G4C70362000000	Pilot Ring 1550E
38	95A33040510000	S.H.C.S. M10 X 30 MM
	99A44547010000	General Service Manual
	99A44547170000	Manual- 950E, 1150E, 1550E& 2050E

* Please Consult CAMCO For spare parts kit Information 800-645-5207

PARTS LIST 2050E INDEX DRIVE (STANDARD CONFIGURATION)

Item no	Part no.	Description
1	G5G71152001002	Hsg-Mach 2050E
2	G5G71187034010	Flwr Wheel Mach 2050E 10H192
2	G5G71187044012	Flwr Wheel Mach 2050E 12H192
2	G5G71187074016	Flwr Wheel Mach 2050E 16H192
2	G5G71187084018	Flwr Wheel Mach 2050E 18H192
2	G5G71187094020	Flwr Wheel Mach 2050E 20H192
3	G5G71227007002	Shaft Inp DE 2050E,W/4608 Red
3	G5G71228007002	Shaft Inp DE 2050E,W/4507 Red
5	86C71176000000	Bearing Outp Alt 2050E
6	G5G71240002002	Cover-Mach 2050E
7	57B40937000000	Cover 1305RDM
8	E6B67676000000	Cover Cam Follower Removal 2050E
9	95A71359050000	Belleville Washer 2050E
10	G5B71211002002	Cover - Side 2050E
11	G5D71175003002	Cartridge Mach Inp 2050E
12	19B55750018800	Shim Inp 2050E .002 Thk
12	19B55750028800	Shim Inp 2050E .005 Thk
12	19B55750038800	Shim Inp 2050E .010 Thk
13	84C65421670000	oil Seal C/R 59010
14	82A71281000000	Cam Flwr RA-E H192 CFH588-2
15	95A63499220000	S.H.C.S. M30 X 50 MM
16	175K2250	Key 1.75 SQ X 22.50 LG
17	86D07328840021	Bearing Cone 99600
18	86D07328840022	Bearing Cup 99100
19	95A55752000000	Locknut PN-36
20	95A55753000000	Lockwasher WH-36
21	95A33000040000	Air Vent 1-11.5 N.P.T.
22	95A33001040000	Sight Plug #LSP-151-06-01
23	95A33003040000	Magnetic Plug Lisle #5062071
24	95A33040980000	S.H.C.S. M20 X 60 MM
25	95A33040330000	S.H.C.S. M8 X 20 MM
26	95A51513500000	Bearing Seal Ring Cord .25" Sq.
27	95A33040320000	S.H.C.S. M8 X 16 MM
27	95A33040340000	S.H.C.S. M8 X 25 MM
28	95A38805650000	S.H.C.S. M20 X 75 MM
29	4MA51903000000	Re Plug 40RGD 1.81
30	95A38805680000	S.H.C.S. M20 X 100 MM
31	95A71349050000	Dowel Pin (Large)
32	95A33040170000	S.H.C.S. M6 X 12 MM
33	55A67134000000	Bore Plug, 3.937 BORE
34	84A66655040000	V-Ring C/R 408500
35	95A38805720000	S.H.C.S. M24 X 80
35	95A38805740000	S.H.C.S. M24 X 100 MM
36	G5G71192000000	Ring - Thru Hole, 2050E
36	G5G71246010000	Stationary Center Post, 2050E 3
37	G5D71194000000	Pilot Ring 2050E
38	95A33040510000	S.H.C.S. M10 X 30 MM
	99A44547010000	General Service Manual
	99A44547170000	Manual E950,E1150,E1550 & E2050

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Automation

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